Project-10

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MEMORANDUM OF UNDERSTANDING

BETWEEN

NATIONAL TIGER CONSERVATION AUTHORITY

AND

WILDLIFE INSTITUTE OF INDIA, DEHRADUN

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Made this day on .....12.2008 between the National Tiger Conservation Authority, Annexe No. 5, Bikaner House, Shahjahan Road, New Delhi-110011 and Wildlife Institute of India, Dehradun, herein referred to as NTCA and WII. It is proposed to initiate a collaborative research project, namely "Radio Telemetry monitoring of source population of tigers in Ranthambhore Tiger Reserve" between the **National Tiger Conservation Authority, New Delhi and Wildlife Institute of India, Dehradun**. The project has a proposed duration of three years, which will be the effective period of this Memorandum of Understanding, beginning from the date of signing by both the parties.

Project Objectives:

1. Monitor the source population of tigers in Ranthambhore Tiger Reserve
   i) Tiger Population estimates within select areas of the reserve.
   ii) Survival and mortality information through mark-recapture study.
2. Monitor prey, co-predator populations, and habitat condition in the Tiger Reserve.
3. Gain an understanding of tiger dispersal patterns and land tenure system.
4. Gain an understanding of the meta-population structure of tigers to evaluate the role of Ranthambhore, tiger Reserve as source population within the larger landscape.

Terms and Conditions:

1. Set out below are the terms and conditions under which **Wildlife Institute of India, Dehradun** has agreed to carryout for National Tiger Conservation Authority the above mentioned assignment specified in the attached Terms of Reference.

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2. For administrative purposes Member Secretary (NTCA) has been assigned to administer the assignment.

3. The National Tiger Conservation Authority may if find it necessary, can postpone or cancel the assignment and /or shorten or extend its duration. However, every effort will be made to give, as early as possible, notice of any changes.

4. This MOU, its meaning and interpretation and the relations between the parties shall be governed by the Laws of Union of India.

5. This MOU will become effective upon confirmation of this letter on behalf of **Wildlife Institute of India** and will terminate 30.11.2011, or such other date as mutually agreed between the National Tiger Conservation Authority and **Wildlife Institute of India**.

6. The cost of the project will not exceed Rs.59.54 lakhs (Rupees Fifty nine lakhs and fifty-four thousand only).

7. **Wildlife Institute of India** will be responsible for appropriate insurance coverage. In this regard, **Wildlife Institute of India** shall maintain workers compensation, employment liability insurance for their staff on the assignment. **Wildlife Institute of India** shall also maintain comprehensive general liability insurance, including MOU liability coverage adequate to cover the indemnity of obligation against all damages, costs, and charges and expenses for injury to any person or damage to any property arising out of, or in connection with, the services which result from the fault of **Wildlife Institute of India** or its staff. **Wildlife Institute of India** shall provide the National Tiger Conservation Authority with certification thereof upon request.

8. **Wildlife Institute of India** shall indemnify and hold harmless the National Tiger Conservation Authority against any and all claims, demands, and/or judgements of any nature brought against the National Tiger Conservation Authority arising out of the services by **Wildlife Institute of India** and it's staff under this MOU. The obligation under this paragraph shall survive the termination of this MOU.

9. **Wildlife Institute of India** agrees that, during the term of this MOU and after its termination, **Wildlife Institute of India** and any entity affiliated with **Wildlife Institute of India**, shall be disqualified from providing goods, works or services (other than the Service and any continuation thereof) for any project resulting from or closely related to the Services.

10. All final plans, drawings, specifications, designs, reports and other documents or software developed under this project by **Wildlife Institute of India** would be joint property of the Wildlife Institute of India and National Tiger Conservation Authority and the Wildlife Institute of India would be allowed to use for academic/ professional purpose with intimation to National Tiger Conservation Authority.

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11. **Wildlife Institute of India** undertakes to carry out the assignment in accordance with the highest standard of professional and ethical competence and integrity, having due regard to the nature and purpose of the assignment, and to ensure that the staff assigned to perform the services under **Wildlife Institute of India**, will conduct themselves in a manner consistent herewith.
12. **Wildlife Institute of India** also agrees that all knowledge and information not within the public domain which may be acquired during the carrying out this MOU, shall be, for all time and for all purpose, regarded as strictly confidential and held in confidence, and shall not be directly or indirectly disclosed to any person whatsoever, expect with the National Tiger Conservation Authority written permission.
13. Any dispute arising out to the MOU, which cannot be amicably settled between the parties, shall be referred to adjudication/arbitration in accordance with Arbitration & Conciliation Act 1996.

Funding for the project (detailed proposal, refer to Annexure 1 of this document):

The project is fully funded by NTCA.

Tasks to be accomplished :

1. The intensive study should address population status, trends, demography and study of ecological aspects for the long term persistence and source value of the tiger population.
2. Modern technological tools like camera traps, radio satellite and GPS telemetry, GIS and molecular genetics should be used to address the research objectives.
3. A pilot project designed to develop and test the protocols of Phase I, II, III and IV for Monitoring Tigers, Co-predators, Prey and their Habitat.
4. As part of the Pilot Project ten tigers were radio-collared with VHF, GPS and Satellite collars. Five of these radio-collared tigers are still being monitored and are providing interesting insights into movement patterns, dispersal, and general ecology. These tigers and an additional 8 individuals need to be monitored for a period of another three years to generate adequate information as envisaged in Phase IV of the protocol to understand long term movement patterns and dispersal of tigers within a landscape.

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Methodology:

- Population estimates of tigers have been obtained within Ranthambhore, Tiger Reserve using capture re-capture by camera traps during the Pilot project and subsequent country wide monitoring project. These populations will continue to be monitored by camera trapping each year so as to estimate tiger numbers, density for each year and survival/mortality between years (Pollock et a. 1989, Karanth et at. 2006).
- Line transects demarcated for Phase I data collection will continue to be monitored using distance sampling (Buckland et al. 1993) for ungulate density estimates, human disturbance and habitat parameters (Jhala et a. 2005).
- Currently radio-collared tigers will continue to be monitored for data collection on habitat use, ranging patterns and dispersal. Radio-collars will be replaced on expiry of battery life or damage on these tigers so as to get long term data from the same individuals at different life stages. Tigers are likely to disperse long distances at the sub-adult stage (2.5 to 3.5 years) or at old age (>8 years for males, and >10 years for females) when territorial residents are displaced by younger tigers. We shall deploy GPS and GPS-Satellite collars on tigers at this stage of their life cycle so as to enable us to track them over vast landscape. One of our radio-collared tigers dispersed from the core of Kanha to Pench Tiger Reserve. We hope to use the latest technology that permits the change of GPS and Satellite duty cycles remotely so that intensive spatial fixes can be obtained at the time of dispersal to plot the dispersal route. The duty cycle would be reprogrammed to a fewer fixes to obtain traditional ecological data on ranging pattern outside of the dispersal phase and save on battery power of the transmitter. Current information on tiger dispersal is sparse (but see Smith 1993) and is crucial for delineating, designing, restoring and managing habitat corridors essential for ensuring long term persistence of meta-population structure (Hanski & Gilpin 1997, Hanski 1998). As a part of this project we aim to collar 8 additional tigers (5 sub-adult pre-dispersal age males, 2 sub-adult females, and one old past prime male). These along with the already collared tigers (with collar replacement when needed) will provide sufficient data within the next 5 years to amply address the above objectives.
- Blood samples from the radio-collared tigers and tiger scat samples from the landscape connecting Kanha Tiger Reserve with Pench, Bandhavgarh, Achanakmar will be collected and analysed to understand metapopulation structure and gene flow. The understanding and estimation of metapopulation structure, dynamics and gene follow is important in the area under study as the entire tiger landscape in the country is fragmented with possible metapopulations across many tiger reserves, protected areas and forest land. Data for fulfilling the work will be obtained by amplifying microsatellite loci from scat DNA extracts. Scats will be systematically collected from the study

area along with their Global Information System (GIS) to establish their map location. The sampling effort would be directed to capture maximum possible genotypes, at least 70% of the total animals in each source population. Highly polymorphic microsatellite loci sequences amplified form the scat DNA extracts will be used to generate unique multilocus genotypes, ie. DNA fingerprints of each tiger for individual identification. Thereafter various population genetic softwares, chiefly STRUCTURE 1.0 and GENECLASS 2.0 will be used to analyse the multilocus genotype data to derive estimates of the number of populations, assigning individuals to particular source populations, calculating rates of gene flow and historic bottlenecking *events (Piry et. al. 2004, Pritchard et. al. 2000, Proctor et. al. 2005)*. Comparison of blood and scat samples from known individual tigers will assist in developing methodology for addressing allelic *dropout* rates from scat amplified microsatellite loci and develop correction factors for such data. The methodology will also have application in individual identification of tigers.

The total cost of the Project:
Rs. 59.54. lakhs

Duration of the Project:
Three years.

Institutional Representatives:

The parties listed below may make amendments, deletions and additions to this MOU on behalf of each party on the basis of mutual agreement.

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